* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the drive approach of the liquid crystal display which was applied to the drive approach of a liquid crystal display, especially is the drive approach of the liquid crystal display of a active-matrix mold, and fitted the movie display.
[0002]
[Description of the Prior Art] In recent years, a liquid crystal display (LCD is called below Liquid Crystal Display:) is spreading also through the field in which enlargement and highly minute-ization treat a dynamic image like the liquid crystal display used as TV etc. from what mainly treats a static image like the liquid crystal display with which the image progressed and displayed is also used for a personal computer, a word processor, etc. LCD is a thin shape compared with TV equipped with CRT (Cathod Ray Tube), and since it can install without occupying a location so much, it is considered that the diffusion rate to a general home will become high from now on.
[0003] Drawing 20 is drawing showing an example of the configuration of the conventional active-matrix mold LCD. This LCD is equipped with the 1st and 2nd glass substrates, and has the liquid crystal display panel section 100 which is the part as which an image is displayed. On the 1st glass substrate, the scanning line 101 of n (n is the natural number) book and the signal line 102 of m (m is the natural number) book are arranged in the shape of a grid, and TFT (Thin Film Transistor)103 which is a nonlinear device (switching element) is formed near [each] the intersection of the scanning line 101 and a signal line 102.
[0004] The gate electrode of TFT103 is connected to the scanning line 101, a source electrode is connected to a signal line 102, and the drain electrode is connected to the pixel electrode 104, respectively. The 2nd glass substrate of the above is arranged in the location which counters with the 1st glass substrate, and the common electrode 105 is formed in the whole surface on the front face of a glass substrate with transparent electrodes, such as ITO. And liquid crystal is enclosed between this common electrode 105 and the pixel electrode 104 formed on the 1st glass substrate.
[0005] The above-mentioned scanning line 101 and a signal line 102 are connected to the scanning-line drive circuit 106 and the signal-line drive circuit 107, respectively. The scanning-line drive circuit 106 carries out the sequential drive of the high potential to the n scanning lines 101, and makes an ON state TFT connected to each scanning line 101. In the condition that the scanning-line drive circuit 106 is scanned, when the signal-line drive circuit 107 outputs the gradation electrical potential difference according to image data to any of m signal lines they are, the amount of transparency of light is controlled by the potential difference with the gradation electrical potential difference which the gradation electrical potential difference was written in the pixel electrode 104 through TFT103 used as an ON state, and was written in the common electrode 105 set as fixed potential, and the pixel electrode 104, and a display is performed. Thus, the liquid crystal display panel section 100 drives.
[0006] Drawing 21 is drawing showing the wave of the signal outputted to the scanning line 101 and a signal line 102 from the scanning-line drive circuit 106 with which the conventional liquid crystal

display is equipped, and the signal-line drive circuit 107. VG1-VGn show the wave of the scan signal impressed to each scanning line 101 in drawing 21 , respectively. As illustrated, the scan signals VG1-VGn are signals by which high potential is impressed only to the one scanning line 101 at a stretch, and a sequential output is carried out to the n scanning lines 101. Moreover, VD shows the wave of the signal outputted to one certain signal line 102, and Vcom shows the wave of the signal impressed to the common electrode 105. In the example shown in drawing 21 , Signal VD is a signal with which signal strength changes according to each image data, and Signal Vcom is a signal which has a fixed value and does not change with time.

[0007] Moreover, in this liquid crystal display, in order to prevent degradation of liquid crystal, it is common to control so that the so-called alternating current drive is performed and long duration impression of the electrical potential difference of a dc component is not carried out to liquid crystal. As an example of an approach which performs an alternating current drive, the electrical potential difference impressed to the common electrode 105 is fixed, and there is a method of impressing the signal level of straight polarity and negative polarity to the pixel electrode 104 by turns.

[0008] When a dynamic image is displayed in this LCD, in the present condition, the problem of causing image quality degradation of an after-image phenomenon etc. arises. Since this cause has the slow speed of response of a liquid crystal ingredient, if gradation change breaks out, it cannot follow in footsteps of gradation change in 1 field period, but since it thought for requiring a number field period and carrying out an accumulation response, research of the liquid crystal ingredient of various high-speed responses as a policy which solves this problem etc. is advanced.

[0009] However, problems, such as the above-mentioned after-image phenomenon, do not have a cause only in the speed of response of liquid crystal, but the report of originating in the method of presentation of LCD is made from NHK Science & Technical Research Laboratories etc. (for example, please refer to the 1999 Institute of Electronics, Information and Communication Engineers synthesis convention, SC-8-1, and pp.207-208 grade). Hereafter, the drive approach of CRT and the drive approach of LCD are compared and explained about the problem of the method of presentation of LCD.

[0010] Drawing 22 is drawing showing the comparison result of the time response of the display light of CRT and LCD about a certain pixel, (a) is drawing showing the time response of CRT, and (b) is drawing showing the time response of LCD. As shown in drawing 22 (a), LCD CRT was indicated to be to drawing 22 (b) to so to speak being [to which during the time of an electron beam being equivalent to the fluorescent substance of a tubular surface to several mm second emits light] an impulse mold indicating equipment is the so-called hold mold indicating equipment holding 1 field period display light until it results [from the time of the writing of the data to a pixel finishing] in the next writing.

[0011] When displaying a dynamic image by CRT and LCD which have this property, the display shown in drawing 23 is performed. Drawing 23 is drawing showing the example of a display of the image at the time of displaying a dynamic image by CRT and LCD, (a) is drawing showing the example of a display of CRT, and (b) is drawing showing the example of a display of LCD. As now shown in drawing 23 (a) and drawing 23 (b), the case where a circular display object moves in the x in drawing direction is considered. In this case, as shown in drawing 23 (a), until just before CRT which is an impulse mold display newly writes in by LCD which is a hold mold display to a display object being momentarily displayed on the location corresponding to time amount, the image in front of 1 field will remain.

[0012] When human being looks at the dynamic image displayed as shown in drawing 23 , the dynamic image will be checked by looking as shown in drawing 24 . Drawing 24 is drawing for explaining the image checked by looking by human being, when displaying a dynamic image by CRT and LCD, and, in the case of CRT, (b) of (a) is the case of LCD. As shown in drawing 24 (a), when an animation is displayed by CRT of an impulse mold display, it will not check by looking, if the image displayed at a certain time laps with the image before that and is displayed. However, if an animation is displayed by LCD of a hold mold display, it will lap, the image in which it is indicated by current by the visual time quadrature effectiveness etc., and the image displayed before will be checked by looking, and the problem of motion dotage will arise.

[0013]
[Problem(s) to be Solved by the Invention] By the way, the problem produced when displaying a dynamic image by LCD mentioned above is received, and the remedy of shoes is shown. One of them is the approach (the severalX scan approach) of newly writing in an image between each field and decreasing motion dotage, by scanning the scanning line by severalX. However, since the severalX scan approach newly needs to make the image inserted between the problem that a frequency becomes high, and the field and the field, it has the problem that a circuit scale will increase.
[0014] Other remedies are the approaches (the shutter approach) of forming a shutter into the optical path of a display and shortening the hold time. This approach is an approach of in the case of for example, the transparency mold LCD carrying out the flash plate of the back light, moving by [of 1 field period] intercepting light in between [that] what percent, and preventing dotage. Moreover, the approach of inserting a black image between each image data as a shutter is proposed (for example, it is JP,10-83169,A etc.).
[0015] Drawing 25 is drawing explaining how to insert a black image, to move between each image data, and to prevent dotage. As the base of this approach impresses the predetermined electrical potential difference which becomes a black display at a level blanking period as shown in drawing 25 (a) to liquid crystal, it moves, and it prevents dotage. That is, after displaying the image of the 1 field, the black display of the whole screen is performed and the image of the next field is displayed. However, since display time differs in the perpendicular direction of the liquid crystal display panel section 100 when it expresses as this approach, the problem that a brightness difference arises by the location of the liquid crystal display panel section 100 as shown in the example of a panel display in drawing 25 (c) arises.
[0016] The method of suppressing generating of this brightness difference is proposed by JP,9-127917,A, JP,10-62811,A, JP,11-30789,A, etc. Drawing 26 is drawing showing the configuration of the liquid crystal display which solves the problem produced by the approach shown in drawing 25 (a). This configuration is proposed by above-mentioned JP,9-127917,A. In addition, the same sign is given to the same member as the conventional liquid crystal display shown in drawing 20 .
[0017] The scanning-line drive circuit 124 for drawing 26 to drive the black signal feed zone 120, the black signal supply line 121, the scanning line 122 for black signal supply, TFT123 for black signal supply, and the scanning line 122 for black signal supply to the conventional circuitry shown in drawing 20 is newly formed as a circuit for "black" display writing. The gate electrode of above-mentioned TFT123 for black signal supply is connected to the scanning line 122 for black signal supply, the source electrode of TFT123 for black signal supply is connected to the black signal supply line 121, and the drain electrode is connected to the drain electrode and the pixel electrode 104 of TFT103, respectively.
[0018] In the liquid crystal display in the above-mentioned configuration, the electrical potential difference according to "black" display is impressed to the pixel electrode 104 in 1 field, and the electrical potential difference according to image data is impressed to the pixel electrode 104 after that. Thus, by driving, it will be reset for every scanning line like the example of a panel display shown in drawing 25 (b). That is, after displaying the image for one screen, generating of the brightness difference by putting in a black screen is abolished like the example of a panel display shown in drawing 25 (d) by resetting per scanning line rather than resetting by making the whole screen "black" display.
[0019] Thus, although generating of the brightness difference in a screen is abolished in the circuit shown in drawing 26 while aiming at reduction of motion dotage Since the black signal feed zone 120, the black signal supply line 121, the scanning line 122 for black signal supply, TFT123 for black signal supply, and the scanning-line drive circuit 124 are needed with this configuration in addition to the configuration of the conventional liquid crystal display shown in drawing 20 While circuitry increased, there was a problem of causing decline in a panel numerical aperture etc.
[0020] This invention is made in view of the above-mentioned situation, and aims at offering the drive approach of the liquid crystal display which moves, without causing increase of a circuit scale, and decline in a panel numerical aperture, and dotage does not produce.
[0021]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, as for this

invention, two or more scanning line and two or more signal lines are arranged in the shape of a grid. It is the drive approach of a liquid crystal display of choosing any one of the scanning lines concerned at a stretch, changing the condition of liquid crystal through a signal line, and performing image display according to image data. Set up the 1st scan period and the 2nd scan period which were set up in time amount shorter than time amount required to scan any one of said the scanning lines, and it sets at said 1st scan period. It is characterized by displaying the image according to said image data through said signal line, and displaying a monochromatic image through said signal line in said 2nd scan period. Moreover, it is characterized by displaying the image of said monochrome in said 2nd scan period of the scanning line which the predetermined number estranged by the scanning line to the scanning line which this invention estranged said 1st scan period and said 2nd scan period in time about the same scanning line, was set up, displayed the image according to said image data in said 1st scan period of a certain scanning line, and displayed said image. Moreover, this invention is characterized by displaying the image of said monochrome on the scanning line with which the predetermined number continued. Moreover, this invention is characterized by outputting the signal about the image according to said image data, and a monochromatic image to said signal line by turns, inverting and outputting the signal about the image according to said image data for said every scan period [the], and inverting and outputting the signal about the image of said monochrome said every 2nd scan period. Moreover, this invention is characterized by the image of said monochrome being an image of "black" color. Moreover, while this invention is constituted so that it may be in "white" display condition when said liquid crystal does not impress said electrical potential difference, and it may be in "black" display condition gradually according to applied voltage The electrical-potential-difference value impressed to inter-electrode [said / pixel electrode and common inter-electrode / said] when it is arranged a pixel electrode and common inter-electrode and the image of "black" color is displayed in said 2nd scan period When performing "black" display in said 1st scan period, it is characterized by considering as size rather than the electrical-potential-difference value impressed to inter-electrode [said / pixel electrode and common inter-electrode / said]. Moreover, it is characterized by carrying out adjustable [of this invention] by the electrical-potential-difference value impressed to inter-electrode [said / pixel electrode and common inter-electrode / said] fixing the electrical potential difference impressed to said common electrode, and making into size the electrical-potential-difference value impressed to said pixel electrode through said signal line. Moreover, this invention is characterized by the electrical-potential-difference value impressed to inter-electrode [said / pixel electrode and common inter-electrode / said] carrying out adjustable by changing the electrical potential difference impressed to said common electrode, while impressing an electrical-potential-difference value to said pixel electrode through said signal line. Moreover, said scanning line is connected to two or more scanning-line drive circuits, and this invention makes two scanning-line drive circuits where it was chosen of said two or more scanning-line drive circuits scan the scanning line in order. In said 1st scan period, it is characterized by stopping one scan of said two selected scanning-line drive circuits, and stopping the scan of another side of said two selected scanning-line drive circuits in said 2nd scan period.

[0022]

[Embodiment of the Invention] Hereafter, with reference to a drawing, the drive approach of the liquid crystal display by the operation gestalt of this invention is explained to a detail.

The [1st operation gestalt] Drawing 1 is drawing for explaining the drive approach by the configuration of the liquid crystal display with which the drive approach by the 1st operation gestalt of this invention is applied, and the 1st operation gestalt of this invention. In this operation gestalt, the image quality at the time of animation display is raised with devising the drive signal wave form impressed to each electrode, without changing the structure of the liquid crystal display panel section 1 with the conventional structure.

[0023] That is, in this operation gestalt, like the conventional liquid crystal display shown in drawing 20 , it has the 1st and 2nd glass substrates, and has the liquid crystal display panel section 1 which is the part as which an image is displayed. On the 1st glass substrate, the scanning line 2 of n (n is the natural number) book and the signal line 3 of m (m is the natural number) book are arranged in the shape of a

grid, and TFT (Thin Film Transistor)4 which is a nonlinear device (switching element) is formed near [each] the intersection of the scanning line 2 and a signal line 3.
[0024] The gate electrode of TFT4 is connected to the scanning line 2, a source electrode is connected to a signal line 3, and the drain electrode is connected to the pixel electrode 5, respectively. The 2nd glass substrate of the above is arranged in the location which counters with the 1st glass substrate, and the common electrode 6 is formed in the whole surface on the front face of a glass substrate with transparent electrodes, such as ITO. And liquid crystal is enclosed between this common electrode 6 and the pixel electrode 5 formed on the 1st glass substrate.
[0025] The scan signal to which the signs VG1-VGn in drawing 1 were given is impressed to the above-mentioned scanning line 2, and the signal according to the image data to which the sign VD in drawing 1 was given is impressed to a signal line 3. Here, as shown in drawing 1 , the scan signal supplied to each scanning line 2 has two scanning-line selection periods of the selection period t1 for image data for writing the gradation electrical potential difference according to image data in the pixel electrode 5, and the selection period t2 for "black" display for writing the electrical potential difference according to "black" display in the pixel electrode 5 in 1 field. In addition, in this operation gestalt, although "black" display is performed in order to emphasize contrast, other colors are sufficient. Moreover, the gradation electrical potential difference according to image data and the electrical potential difference according to "black" display are outputted to each signal line 3 by turns.
[0026] The selection period t2 for "black" display which is the description of this operation gestalt performs "black" display to the scanning line 2 under the multi-line of the scanning line 2 of the conventional scanning-line selection period t3 with which it considers as 1/2 period mostly, and the selection period t1 for image data is chosen, or on a multi-line, as shown in drawing 1 . The electrical potential difference according to "black" display is impressed to the signal line 3 in the selection period t2 for "black" display, and the so-called reset drive to which a black screen is displayed and the liquid crystal capacity 7 performs "black" display for every scanning line is made.
[0027] Next, actuation of the liquid crystal display by the 1st operation gestalt of this invention in the above-mentioned configuration is explained to a detail. In the following explanation, scanning-line 2 each which has more than one is distinguished using the signs G1-Gn in drawing, and signal-line 3 each is distinguished using Signs D1-Dm. Suppose that the display of image data is performed in order of the scanning lines G1 and G2 and --, and "black" display is now performed from j (j the natural number : $1<j<=n$) Motome's scanning line Gj.
[0028] First, the scanning line G1 is chosen as a selection period t1 for image data, and the gradation electrical potential difference according to image data is impressed to a signal line D1 in this condition. TFT4 connected to the scanning line G1 will be turned on, and the display of the liquid crystal capacity 7 will be the display according to image data. Next, the scanning line Gj is chosen as a selection period t2 for "black" display, and the electrical potential difference according to "black" display is impressed to a signal line 3 in this condition. If this electrical potential difference is impressed, TFT4 connected to the scanning line Gj will be in an ON state, and the liquid crystal capacity 7 will serve as "black" display.
[0029] Progress of the selection period t2 for "black" display of the scanning line Gj makes the same actuation as the case where scanning-line Gj+1 was scanned and the degree of the scanning line G2 with which the same actuation as the case where the scanning line G2 was scanned and the scanning line G1 is scanned next is made scans the scanning line Gj. The scanning line 2 is chosen in order of scanning-line G3, Gj+2, and -- similarly hereafter. By taking such a drive approach, as shown in drawing 2 , a band-like black screen-display field is displayed on the liquid crystal display panel section 1.
[0030] Drawing 2 is drawing showing the contents of a display displayed on the liquid crystal display panel section 1 in instant, when the drive approach of the liquid crystal display by the 1st operation gestalt of this invention is used. As shown in drawing 2 , when [of the liquid crystal display panel section 1] mostly set as the center section, one screen usually consists of three viewing areas with image display field A3 for the selection period t2 for "black" display with the image display field A1 and "black" screen-display field A2. As time amount passes "black" screen-display field A2 If it moves in the direction where the sign D1 in drawing 2 was attached and "black" screen-display field A2 arrives at

the lowest edge of the liquid crystal display panel section 1 It moves to the maximum upper limit of the liquid crystal display panel section 1, and while the area which "black" screen-display field A2 in the lowest edge occupies decreases, and the area which "black" screen-display field A2 in the maximum upper limit occupies increases, it moves in the direction where the sign D1 in drawing was attached in a part of "black" screen-display field A2.

[0031] Thus, the drive approach of the liquid crystal equipment by this operation gestalt prevents the motion dotage at the time of animation display. In addition, spacing of the scanning line chosen in the selection period t2 for "black" display and the scanning line chosen in the selection period for image data serves as "black" screen-display field A2. In one screen, the rate that "black" screen-display field A2 occupies is made into extent with which the motion dotage at the time of animation display is not checked. Moreover, in the drive approach of this operation gestalt, like the image display field A1 and A3, the scanning line 2 of every one line will scroll, and "black" screen-display field A2 does not usually cause the brightness difference by the location of the display screen.

[0032] In the drive approach by the 1st operation gestalt of this invention explained above, although the case where the selection period t2 for "black" display was set up after the selection period t1 for image data was explained, even if it sets up in order of the selection period t2 for "black" display, and the selection period t1 for image data, the same effectiveness is acquired.

[0033] Next, the polarity-reversals approach of the signal outputted to a signal line 3 is explained. In order to prevent that long duration impression of the electrical potential difference of a dc component is carried out at the liquid crystal capacity 7, the so-called alternating current drive which impresses the electrical potential difference of straight polarity and negative polarity by turns from the former is made. As mentioned above, in this operation gestalt, the signal VD outputted to a signal line 3 outputs the gradation electrical potential difference according to image data, and the electrical potential difference according to "black" display by turns. Here, the case where it has the electrical-potential-difference-permeability property that the liquid crystal prepared in the liquid crystal display panel section 1 is shown in drawing 3 is considered. Drawing 3 is drawing showing the electrical-potential-difference-permeability property of Nor Marie White's so-called liquid crystal. If the permeability of liquid crystal becomes beyond a value with the electrical-potential-difference value which is about 100% and is impressed when the electrical-potential-difference value impressed to liquid crystal is 0 [V], as shown in drawing 3 , permeability will decrease rapidly, and when an electrical-potential-difference value is further made high, it stops almost penetrating light.

[0034] If a polarity is reversed for every output of a signal line 3 like before when the liquid crystal which has the property shown in drawing 3 is used "The gradation electrical potential difference according to the image data of straight polarity", "the electrical potential difference according to "black" display of negative polarity", "The gradation electrical potential difference according to the image data of straight polarity", "the electrical potential difference according to "black" display of negative polarity", Since [of -- (or "the gradation electrical potential difference according to the image data of negative polarity", "the electrical potential difference according to "black" display of straight polarity", "the gradation electrical potential difference according to the image data of negative polarity", "the electrical potential difference according to "black" display of straight polarity", --)] an electrical potential difference is outputted to a signal line 3 in order, The electrical potential difference according to "black" display which is the maximum gradation electrical potential difference always serves as like-pole nature, and a dc component will be impressed to the liquid crystal capacity 7.

[0035] In this operation gestalt, in order to cancel the above-mentioned fault, polarity reversals are performed according to an individual, respectively, and the gradation electrical potential difference according to image data and the electrical potential difference according to "black" display are outputted to a signal line 3. Drawing 4 is drawing showing an example of the polarity reversals of the gradation electrical potential difference in the drive approach of this operation gestalt. In drawing 4 , only the scan signal VG 1 and the scan signal VGj in drawing 1 are illustrated as a scan signal, and the time relation of these scan signals and the signal outputted to a signal line 3 is illustrated.

[0036] For example As shown in the signal VD in drawing 4 , the signal of "gradation electrical

potential difference according to image data of straight polarity" V1, "electrical potential difference according to "black" display of straight polarity" V2, "gradation electrical potential difference according to image data of negative polarity" V3, "electrical potential difference according to "black" display of negative polarity" V4, and -- which changes in order It prevents that long duration impression of the electrical potential difference of a dc component is carried out in the liquid crystal capacity 7 by outputting to a signal line 3. Next, its attention is paid to the polarity of the electrical potential difference impressed for every pixel. Drawing 5 is drawing showing the polarity for every pixel in simple, when the signal VD shown in drawing 4 is impressed to a signal line 3. As shown in drawing 5 , in each pixel, it comes to cancel the applied voltage of a dc component in the 2 fields.

[0037] In addition, the polarity-reversals approach may be outputted to a signal line in order of "the gradation electrical potential difference according to the image data of straight polarity", "the electrical potential difference according to "black" display of negative polarity", "the gradation electrical potential difference according to the image data of negative polarity", "the electrical potential difference according to "black" display of straight polarity", and --. Moreover, in explanation of drawing 4 , although the case where the electrical potential difference Vcom impressed to the common electrode 6 was fixed was explained, as shown in drawing 6 , the alternating current drive of the electrical potential difference Vcom may be carried out. The electrical potential difference on which the reason is impressed to the liquid crystal capacity 7 is because it becomes settled with a difference with the gradation electrical potential difference according to the image data written in through the common electrode 6 and a signal line 3, or the electrical potential difference according to "black" display. Drawing 6 is drawing explaining the actuation in the case of carrying out the alternating current drive of the electrical potential difference Vcom impressed to the common electrode 6. In this case, since the electrical potential difference impressed to the liquid crystal capacity 7 becomes settled as mentioned above with a difference with the gradation electrical potential difference according to the image data written in through the common electrode 6 and a signal line 3, or the electrical potential difference according to "black" display, the electrical potential difference written in through a signal line 3 will be good by the low battery by carrying out the alternating current drive of the electrical potential difference Vcom. In this drive approach, an electrical potential difference Vcom is reversed every 2 of the selection period t1 for image data, and the selection period t2 for "black" display selection periods. In addition, the timing wave of the scan signals VG1 and VGj in drawing 4 and drawing 6 is illustrated about the case where the field of the one half of the liquid crystal display panel section 1 sets it as a black screen-display field as an example.

[0038] In the above operation gestalt, although the case where the liquid crystal display panel section 1 is equipped with Nor Marie White's liquid crystal has been explained, when not impressing an electrical potential difference to liquid crystal, it is in "black" display condition, and effectiveness with the same said of the case where it consists of so-called Nor Marie Black who will be in "white" display condition gradually according to applied voltage is acquired. As explained above, the drive approach by the 1st operation gestalt of this invention realizes a movie display without image quality degradation, without changing the liquid crystal display panel section 1 with the conventional configuration. Therefore, it can move without causing increase of a circuit scale, and decline in a panel numerical aperture, and dotage can be prevented.

[0039] The [2nd operation gestalt] The drive approach of the liquid crystal display by the 2nd operation gestalt of this invention is explained to a detail below. Drawing 7 is drawing for explaining the drive approach of the liquid crystal display by the 2nd operation gestalt of this invention. Although the gradation electrical potential difference is inverted and driven in this operation gestalt like the drive approach shown in drawing 4 as shown in drawing 7 The points highly set as the selection period t2 for "black" display compared with the electrical-potential-difference value in case the gradation electrical potential difference according to the image data by which the value of the electrical potential difference according to "black" display supplied to a signal line 3 is supplied to a signal line 3 at the selection period t1 for image data is "black" display differ. That is, in this operation gestalt, even if it is the case where the same "black" is displayed, the direction of the value of the electrical potential difference

according to "black" display to which the electrical potential difference impressed to liquid crystal is supplied to a signal line 3 at the selection period t2 for "black" display is set up highly. In addition, the liquid crystal display with which this operation gestalt is applied is a liquid crystal display of a configuration of having been shown in drawing 1 .

[0040] This drive approach is effective to set up "black" screen-display field A2 shown in drawing 2 few. Because, since the time amount from the selection period t2 for "black" display to the selection period t1 for image data becomes short when setting up "black" screen-display field A2 few, it is because it is possible not to be completely indicated by "black" in liquid crystal, such as TN mode in which a speed of response is slow.

[0041] Generally, the speed of response of liquid crystal is decided by the rate Ton which starts by the electric field to which the liquid crystal molecule was impressed, and the rate Toff which returns to the original condition according to the force between each molecule when electric field are made into zero, and a rate Ton and Toff are expressed with the following (1) types and (2) types, respectively.

Ton =etad2/(deltaepsilonV-K pi 2) ..... (1) < BR>Toff=eta d2/(Kpi2) ..... (2)

[0042] Here, K is a constant expressed with K=K1+ (K3-2K2), when emission of liquid crystal, torsion, and the elastic modulus of bending are set to K1, K2, and K3, respectively. Moreover, for deltaepsilon, the dielectric constant difference of the dielectric constant of the direction of a major axis of a liquid crystal molecule and the dielectric constant of the direction of a minor axis and eta are [the thickness of a liquid crystal cell and V of the torsion viscosity of a liquid crystal molecule and d] applied voltage.

[0043] As shown in the above-mentioned (1) formula, the rate at which a liquid crystal molecule starts, so that applied voltage is large becomes quick. The liquid crystal with which the liquid crystal display panel section 1 in this operation gestalt is equipped is Nor Marie White, and has the property shown in drawing 8 . Drawing 8 is drawing showing the electrical-potential-difference-permeability property of the liquid crystal with which the liquid crystal display by the 2nd operation gestalt of this invention is equipped. It is an electrical-potential-difference value in case the gradation electrical potential difference according to the image data by which the electrical-potential-difference value VB 1 is supplied into drawing 8 to a signal line 3 at the selection period t1 for image data is "black" display, and the electrical-potential-difference value VB 2 is a value of the electrical potential difference according to "black" display supplied to a signal line 3 at the selection period t2 for "black" display. Thus, it is set up more highly than the electrical-potential-difference value VB 1 in case the gradation electrical potential difference according to the image data by which the value VB 2 of the electrical potential difference according to "black" display supplied to a signal line 3 at the selection period t2 for "black" display is supplied to a signal line 3 at the selection period t1 for image data is "black" display. Thus, even if it is the case where "black" screen-display field A2 shown in drawing 2 by setting up is set up few, the speed of response of liquid crystal can be made quick, and it becomes possible to make it "black" display completely as a result.

[0044] Moreover, the view set up highly the value of the electrical potential difference according to "black" display supplied to a signal line 3 at the view t2 in this operation gestalt, i.e., the selection period for "black" display, compared with an electrical-potential-difference value in case the gradation electrical potential difference according to the image data supplied to a signal line 3 at the selection period t1 for image data is "black" display can be applied also when carrying out the alternating current drive of the common electrode 6 shown in drawing 6 . Drawing 9 is drawing explaining the actuation in the case of setting up highly the value of the electrical potential difference according to "black" display which carries out the alternating current drive of the electrical potential difference Vcom impressed to the common electrode 6, and is supplied to a signal line 3 at the selection period t2 for "black" display compared with an electrical-potential-difference value in case the gradation electrical potential difference according to the image data supplied to a signal line 3 at the selection period t1 for image data is "black" display. Although the electrical potential difference Vcom impressed to the common electrode 6 is driven with the same electrical-potential-difference value if drawing 9 is compared with drawing 6 , the value of the signal VD supplied to a signal line 3 is larger than the value of the signal VD shown in drawing 6 . However, when the value of the signal VD shown in the value and drawing 7 of the signal

VD shown in drawing 9 is compared, the value of the signal VD shown in drawing 9 is better at a small value.

[0045] The [3rd operation gestalt] The drive approach of the liquid crystal display by the 3rd operation gestalt of this invention is explained to a detail below. Drawing 10 is drawing for explaining the drive approach of the liquid crystal display by the 3rd operation gestalt of this invention. The 3rd operation gestalt of this invention is also related with what cancels the trouble at the time of setting up "black" screen-display field A2 in the trouble mentioned above, i.e., drawing 2 , few. The liquid crystal display panel section 1 of this operation gestalt is the same configuration as the liquid crystal display panel section 1 shown in drawing 1 , and has Nor Marie White's liquid crystal.

[0046] As shown in drawing 10 , the drive approach of this operation gestalt is performing the alternating current drive by driving an electrical potential difference Vcom like the drive approach shown in drawing 9 . However, by the drive approach shown in drawing 9 , although the value of the electrical potential difference Vcom supplied to the common electrode 6 in the selection period t1 for image data and the value of the electrical potential difference Vcom supplied to the common electrode 6 in the selection period t2 for "black" display are the same The drive approach in this operation gestalt shown in drawing 10 is fluctuating the value of the electrical potential difference Vcom supplied to the common electrode 6 in the selection period t1 for image data, and the value of the electrical potential difference Vcom supplied to the common electrode 6 in the selection period t2 for "black" display. Moreover, in drawing 10 , the value of the electrical potential difference according to "black" display supplied to a signal line 3 at the selection period t2 for "black" display and the electrical-potential-difference value in case the gradation electrical potential difference according to the image data supplied to a signal line 3 at the selection period t1 for image data is "black" display are set as the same value.

[0047] That is, the difference from the drive approach shown in the drive approach shown in drawing 10 and drawing 9 is changing the electrical-potential-difference value supplied to the common electrode 6 by drawing 10 to changing the electrical-potential-difference value supplied to a signal line 3 in drawing 9 . The same effectiveness as the drive approach shown in ****7 and drawing 9 is acquired by driving by such drive approach. In addition, the timing wave of drawing 7 , drawing 9 , and the scan signals VG1 and VGj in drawing 10 is shown about the case where the field of the one half of the liquid crystal display panel section 1 is a black screen-display field as an example.

[0048] The [4th operation gestalt] The drive approach of the liquid crystal display by the 4th operation gestalt of this invention is explained to a detail below. Drawing 11 is drawing showing the configuration of the liquid crystal display with which the drive approach of the liquid crystal display by the 4th operation gestalt of this invention is applied. Like the liquid crystal display with which the drive approach by the 1st operation gestalt of this invention shown in drawing 1 is applied, the liquid crystal display with which the drive approach of the liquid crystal display by the 4th operation gestalt of this invention is applied is equipped with the 1st and 2nd glass substrates, and has the liquid crystal display panel section 1 which is the part as which an image is displayed. On the 1st glass substrate, the scanning line 2 of n (n is the natural number) book and the signal line 3 of m (m is the natural number) book are arranged in the shape of a grid, and TFT4 which is a nonlinear device (switching element) is formed near [each] the intersection of the scanning line 2 and a signal line 3.

[0049] The gate electrode of TFT4 is connected to the scanning line 2, a source electrode is connected to a signal line 3, and the drain electrode is connected to the pixel electrode 5, respectively. The 2nd glass substrate of the above is arranged in the location which counters with the 1st glass substrate, and the common electrode 6 is formed in the whole surface on the front face of a glass substrate with transparent electrodes, such as ITO. And liquid crystal is enclosed between this common electrode 6 and the pixel electrode 5 formed on the 1st glass substrate.

[0050] The above-mentioned scanning line 2 is connected to different scanning-line drive circuits 11-14 according to the location arranged at the liquid crystal display panel section 1. That is, the n/4 scanning line 2 is connected to the scanning-line drive circuit 11 from on the liquid crystal display panel section 1, the following n/4 scanning line 2 is connected to the scanning-line drive circuit 12, the following n/4 scanning line 2 is connected to the scanning-line drive circuit 13, and the last n/4 scanning line 2 is

connected to the scanning-line drive circuit 14. While the scan start pulses STV1-STV4 are supplied to the scanning-line drive circuits 11-14, respectively, the scan clock VCLK is inputted. Moreover, the output-control signal OE is inputted into the scanning-line drive circuits 11 and 12, and the signal which reversed the output-control signal OE by inverter circuits 15 and 16 is inputted into the scanning-line drive circuits 13 and 14. In addition, the signal which reversed the output-control signal OE on account of declared in this specification is indicated to be output-control signal OE-.

[0051] The scan start pulses STV1-STV4 are signals by which 2 pulse inputs are respectively carried out per 1 field, and if the scan start pulses STV1-STV4 are inputted, the scanning-line drive circuits 11-14 will perform sequential scanning in the liquid crystal display panel section 1 upper part among the scanning lines 2 connected from the scanning line 2 which will carry out a location soon synchronizing with the scan clock VCLK inputted. The output-control signal OE is a signal controlled so that the scanning-line drive circuits 11-14 do not scan the scanning line 2. Moreover, the signal line 3 is connected to the signal-line drive circuit 20, and the signal start pulse STH, the data input clock HCLK, the output-control signal STB, Data data, the criteria gradation electrical potential differences V0-V9, and the polarity-reversals control signal POL are inputted into the signal-line drive circuit 20. Based on these signals, the signal-line drive circuit 20 generates Signal VD, and outputs it to each signal line 3. The polarity of the electrical potential difference outputted to a signal line 3 based on the polarity-reversals control signal POL is controlled reversed for every two outputs. Thus, it prevents that direct current voltage is impressed to liquid crystal by inverting.

[0052] Drawing 12 is the timing chart of the signal which spreads the liquid crystal display with which the drive approach of the liquid crystal display in the 4th operation gestalt of this invention is applied. As shown in drawing 12 , the scan start pulses STV1 and STV3 inputted into the scanning-line drive circuits 11 and 13 are the pulse signals of an inphase, and are the signals with which the period of the scan start pulses STV2 and STV4 inputted into the scanning-line drive circuits 12 and 14 was the same as the period of the scan start pulses STV1 and STV3 with signals, and the phase shifted to the scan start pulses STV1 and STV3 only in the half period.

[0053] Moreover, the scan clock VCLK supplied to the scanning-line drive circuits 11-14 is a clock which has the period of the one half of the period of the conventional scan clock. Moreover, in this operation gestalt, it has two scanning-line selection periods of the selection period t1 for image data for writing the gradation electrical potential difference according to image data in the pixel electrode 5, and the selection period t2 for "black" display for writing the electrical potential difference according to "black" display in the pixel electrode 5 in 1 field.

[0054] The scan signals VG1-VGn in drawing 12 are signals supplied to the scanning lines of each to which the sign G1 in drawing 11 - Sign Gn were given. In this operation gestalt, the gradation electrical potential difference according to image data is written in order from the scanning line 2 to which the sign G1 in drawing 11 was given, the electrical potential difference according to "black" display is arranged in the center section of the liquid crystal display panel section 1 from it, and it is written in sequentially from the scanning line 2 with which Sign Gn / 2+1 was attached in drawing 11 . The electrical potential difference according to "black" display is impressed to the signal line 3 in the selection period t2 for "black" display, and the so-called reset drive to which a black screen is displayed and the liquid crystal capacity 7 performs "black" display for every scanning line is made. In addition, in this operation gestalt, although "black" display is performed in order to emphasize contrast, other colors are sufficient. Moreover, the gradation electrical potential difference according to image data and the electrical potential difference according to "black" display are outputted to each signal line 3 by turns.

[0055] Next, actuation of the liquid crystal display shown in drawing 11 is explained to a detail. First, if the scan start pulses STV1 and STV3 are inputted into the scanning-line drive circuit 11 and the scanning-line drive circuit 13, the scanning-line drive circuit 11 will scan the scanning line 2 to which the sign G1 in drawing 11 was given, and the scanning-line drive circuit 13 will start the scan of the scanning line 2 to which the sign Gn in drawing 11 / 2+1 was given. However, if drawing 12 is referred to, since output-control signal OE- which the output-control signal OE inputted into the scanning-line drive circuit 11 is a low level, and is inputted into the scanning-line drive circuit 13 is high-level, only

the scanning line 2 to which the sign G1 was given in fact is scanned. The signal-line drive circuit 20 writes the gradation electrical potential difference according to image data in the pixel electrode 5 through TFT4 connected to the scanning line 2 to which the sign G1 was given during the selection period t1 for image data when the scanning line 2 to which the sign G1 was given is scanned.

[0056] After the selection period t1 for image data expires, it shifts to the selection period t2 for "black" display, and the output-control signal OE inputted into the scanning-line drive circuit 11 becomes high-level, and output-control signal OE- inputted into the scanning-line drive circuit 13 is set to a low level. Therefore, in the selection period t2 for "black" display, it will be in the condition that only the scanning line 2 to which Sign Gn / 2+1 was given is scanned. In the selection period t2 for "black" display when the scanning line 2 to which Sign Gn / 2+1 was given is scanned, the signal-line drive circuit 20 writes the electrical potential difference according to "black" display in the pixel electrode 5 through TFT4 connected to the scanning line 2 to which Sign Gn / 2+1 was given. Next, the scanning-line drive circuit 11 scans the scanning line 2 to which the sign G2 in drawing 11 was given, and the scanning-line drive circuit 13 scans the scanning line 2 to which the sign Gn in drawing 11 / 2+2 was given, and it repeats the actuation which mentioned above.

[0057] After the scanning-line drive circuit 11 and the scanning-line drive circuit 13 finish a scan to all the connected scanning lines 2, the scan start pulses STV2 and STV4 are inputted into the scanning-line drive circuit 12 and the scanning-line drive circuit 14, the scanning-line drive circuit 12 scans the scanning line 2 to which the sign Gn in drawing 11 / 4+1 was given, and the scanning-line drive circuit 14 scans the scanning line 2 to which sign G3in drawing 11 n / 4+1 was given. In this case, the output-control signal OE inputted into the scanning-line drive circuit 12 is set to a low level, and output-control signal OE- inputted into the scanning-line drive circuit 14 becomes high-level. Therefore, the scanning line 2 to which Sign Gn / 4+1 was given in fact is scanned. The signal-line drive circuit 20 writes the gradation electrical potential difference according to image data in the pixel electrode 5 through TFT4 connected to the scanning line 2 to which Sign Gn / 4+1 was given during sign Gn / 4 selection period t1 for image data when the scanning line 2 to which +1 was given is scanned.

[0058] After the selection period t1 for image data expires, it shifts to the selection period t2 for "black" display, and the output-control signal OE inputted into the scanning-line drive circuit 11 becomes high-level, and output-control signal OE- inputted into the scanning-line drive circuit 13 is set to a low level. Therefore, in the selection period t2 for "black" display, it will be in the condition that only the scanning line 2 to which sign G3n / 4+1 was given is scanned. In the selection period t2 for "black" display when the scanning line 2 to which sign G3n / 4+1 was given is scanned, the signal-line drive circuit 20 writes the electrical potential difference according to "black" display in the pixel electrode 5 through TFT4 connected to the scanning line 2 to which sign G3n / 4+1 was given. Next, the scanning-line drive circuit 12 scans the scanning line 2 to which the sign Gn in drawing 11 / 4+2 was given, and the scanning-line drive circuit 14 scans the scanning line 2 to which sign G3in drawing 11 n / 4+2 was given, and it repeats the actuation which mentioned above.

[0059] After the scanning-line drive circuit 12 and the scanning-line drive circuit 14 finish a scan to all the connected scanning lines 2, the scan start pulses STV1 and STV3 are inputted into the scanning-line drive circuit 11 and the scanning-line drive circuit 13, the scanning-line drive circuit 11 scans the scanning line 2 to which the sign G1 in drawing 11 was given, and the scanning-line drive circuit 13 starts the scan of the scanning line 2 to which the sign Gn in drawing 11 / 2+1 was given. Here, if drawing 12 is referred to, since the phase of the output-control signal OE and output-control signal OE- is reversed, in the selection period t1 for image data, the output-control signal OE inputted into the scanning-line drive circuit 11 is high-level, and output-control signal OE- inputted into the scanning-line drive circuit 13 is set to a low level. Consequently, only the scanning line 2 to which Sign Gn / 2+1 was given in fact is scanned. The signal-line drive circuit 20 writes the gradation electrical potential difference according to image data in the pixel electrode 5 through TFT4 connected to the scanning line 2 to which Sign Gn / 2+1 was given during sign Gn / 2 selection period t1 for image data when the scanning line 2 to which +1 was given is scanned.

[0060] After the selection period t1 for image data expires, it shifts to the selection period t2 for "black"

display, and the output-control signal OE inputted into the scanning-line drive circuit 11 is set to a low level, and output-control signal OE- inputted into the scanning-line drive circuit 13 becomes high-level. Therefore, in the selection period t2 for "black" display, it will be in the condition that only the scanning line 2 to which the sign G1 was given is scanned. In the selection period t2 for "black" display when the scanning line 2 to which the sign G1 was given is scanned, the signal-line drive circuit 20 writes the electrical potential difference according to "black" display in the pixel electrode 5 through TFT4 connected to the scanning line 2 to which the sign G1 was given. Next, the scanning-line drive circuit 11 scans the scanning line 2 to which the sign G2 in drawing 11 was given, and the scanning-line drive circuit 13 scans the scanning line 2 to which the sign Gn in drawing 11 / 2+2 was given, and it repeats the actuation which mentioned above.

[0061] After the scanning-line drive circuit 11 and the scanning-line drive circuit 13 finish a scan to all the connected scanning lines 2, the scan start pulses STV2 and STV4 are inputted into the scanning-line drive circuit 12 and the scanning-line drive circuit 14, the scanning-line drive circuit 12 scans the scanning line 2 to which the sign Gn in drawing 11 / 4+1 was given, and the scanning-line drive circuit 14 scans the scanning line 2 to which sign G3in drawing 11 n / 4+1 was given. In this case, the output-control signal OE inputted into the scanning-line drive circuit 12 becomes high-level, and output-control signal OE- inputted into the scanning-line drive circuit 14 is set to a low level. Therefore, the scanning line 2 to which sign G3n / 4+1 was given in fact is scanned. The signal-line drive circuit 20 writes the gradation electrical potential difference according to image data in the pixel electrode 5 through TFT4 connected to the scanning line 2 to which Sign Gn / 4+1 was given during sign G3n / 4 selection period t1 for image data when the scanning line 2 to which +1 was given is scanned.

[0062] After the selection period t1 for image data expires, it shifts to the selection period t2 for "black" display, and the output-control signal OE inputted into the scanning-line drive circuit 11 is set to a low level, and output-control signal OE- inputted into the scanning-line drive circuit 13 becomes high-level. Therefore, in the selection period t2 for "black" display, it will be in the condition that only the scanning line 2 to which Sign Gn / 4+1 was given is scanned. In the selection period t2 for "black" display when the scanning line 2 to which Sign Gn / 4+1 was given is scanned, the signal-line drive circuit 20 writes the electrical potential difference according to "black" display in the pixel electrode 5 through TFT4 connected to the scanning line 2 to which Sign Gn / 4+1 was given. Next, the scanning-line drive circuit 12 scans the scanning line 2 to which the sign Gn in drawing 11 / 4+2 was given, and the scanning-line drive circuit 14 ends the writing of the 1 field, after ending the scan of all the scanning lines 2 that repeat the actuation which scanned the scanning line 2 to which sign G3in drawing 11 n / 4+2 was given, and mentioned above, and are connected. In addition, in drawing 11 , although the case where it had four scanning-line drive circuits 11-14 was mentioned as the example and explained, this operation gestalt is not restrained by the number of a scanning-line drive circuit.

[0063] Next, these comparisons are performed in order to clarify the drive approach of a liquid crystal display, the drive approach of the conventional liquid crystal display, and difference by the 4th operation gestalt of this invention. Drawing 13 is drawing showing the configuration of the liquid crystal display with which the drive approach of the conventional liquid crystal display is applied, and drawing 14 is a timing chart which shows the drive approach of the conventional liquid crystal display. The configuration of the liquid crystal display with which the drive approach of the conventional liquid crystal display shown in drawing 13 is applied is the same configuration as the liquid crystal display by the 4th operation gestalt of this invention shown in drawing 11 . However, the input edge into which the output-control signal OE is inputted is grounded, and the scan start pulse STV1 is [only being inputted into the scanning-line drive circuit 12, and]. The shift start pulse STVR outputted to the scanning-line drive circuit 12 from the scanning-line drive circuit 11 as a scan start pulse STVL is inputted. In the scanning-line drive circuit 13 as a scan start pulse STVL The shift start pulse STVR outputted from the scanning-line drive circuit 12 is inputted, and it differs in the scanning-line drive circuit 14 in that the shift start pulse STVR outputted from the scanning-line drive circuit 13 is inputted as a scan start pulse STVL.

[0064] That is, column connection of the scanning-line drive circuit 11 is made, and the conventional

liquid crystal display shown in drawing 13 is scanned in order from the scanning line 2 to which the sign G1 was given to a sign G2, sign G3, --, the scanning line 2 to which Sign Gn was given. The number of outputs is restricted and, as for the scanning-line drive circuits 11-14, it is [each scanning line 2] common to drive by two or more scanning-line drive circuits 11-14. Moreover, the polarity-reversals control signal POL which can reverse the polarity of the electrical potential difference outputted to a signal line 3 is inputted, and the signal-line drive circuit 208 controls the polarity-reversals control signal POL to reverse the polarity of the electrical potential difference outputted to a signal line 3 for every output.

[0065] Thus, although the conventional liquid crystal display shown in drawing 13 and the liquid crystal display by the 4th operation gestalt of this invention have an almost the same configuration In the 4th operation gestalt of this invention, while forming the selection period t1 for image data, and the selection period t2 for "black" display When the scanning line 2 scanned at once using the output-control signal OE and output-control signal OE- controls only to one, the so-called reset drive which performs "black" display for every scanning line is performed. In this operation gestalt, since it is constituted using the same liquid crystal display panel section 1 as usual which is a configuration, the signal-line drive circuit 20, and the scanning-line drive circuits 11-14, the motion dotage at the time of animation display can be improved, without causing a cost rise.

[0066] The [5th operation gestalt] Next, the drive approach of the liquid crystal display by the 5th operation gestalt of this invention is explained to a detail. In the 4th operation gestalt of this invention explained by drawing 11 and drawing 12 , although it was the case where one half of a viewing area was made into a black screen area, in this operation gestalt, 1/4 or 3/4 of a viewing area is set as a black screen area.

[0067] Drawing 15 is drawing showing the configuration of the liquid crystal display with which the drive approach of the liquid crystal display by the 5th operation gestalt of this invention is applied. The liquid crystal display with which the drive approach of the liquid crystal display by the 5th operation gestalt of this invention shown in drawing 15 is applied Although a different point from the liquid crystal display with which the drive approach of the liquid crystal display by the 4th operation gestalt of this invention shown in drawing 11 is applied formed inverter circuits 15 and 16 into drawing 11 and supplied output-control signal OE- to the scanning-line drive circuit 13 and the scanning-line drive circuit 14 In this operation gestalt, while supplying the output-control signal OE to the scanning-line drive circuit 13 except for an inverter circuit 15, it is the point which forms an inverter circuit 17 and supplied output-control signal OE- to the scanning-line drive circuit 12.

[0068] In this operation gestalt, 1/4 or 3/4 of a viewing area is set as a black screen area by changing the drive approach using the liquid crystal display of a configuration of having been shown in drawing 15 . Drawing 16 is the timing chart of the signal which spreads each part in the case of setting one fourth of viewing areas as a black screen area, and drawing 17 is the timing chart of the signal which spreads each part in the case of setting three fourths of viewing areas as a black screen area. If drawing 16 and drawing 17 are referred to, by changing the combination and its input timing of the output-control signal OE made to input into the scanning-line drive circuits 11-14, and output-control signal OE-, 1/4 or 3/4 of a viewing area will be set as a black screen area. In addition, in drawing 16 and drawing 17 , the phase of the output-control signal OE and output-control signal OE- is reversed in time of day t11, t12, and t13.

[0069] Operation gestalt] besides [Although the 1st - the 5th operation gestalt of this invention were explained above, as this invention is shown in drawing 18 and drawing 19 , the scanning-line drive circuit 11, the scanning-line drive circuit 12, the scanning-line drive circuit 13, and the scanning-line drive circuit 14 can be applied also when column connection is made. Drawing 18 and drawing 19 are drawings showing the configuration of the liquid crystal display with which the drive approach of the liquid crystal display by other operation gestalten of this invention is applied.

[0070] In this case, the scan start pulse STV1 the scan start pulse STVL is indicated to be to drawing 12 , drawing 16 , and drawing 17 according to a black screen area, respectively is inputted. By inputting into STVL of the scanning-line drive circuit of the next step the shift start pulse STVR outputted from

each scanning-line drive circuit of the preceding paragraph by which column connection was made The role of each scan start pulse STV2, STV3, and STV4 in drawing 12 , drawing 16 , and drawing 17 will be played, and it will drive similarly.

[0071] As mentioned above, as explained, according to other operation gestalten of this invention, the rate of a black viewing area is decided every scanning-line drive circuit 11-14. Moreover, since it can constitute only from devising the control signal inputted into the scanning-line drive circuits 11-14 and the signal-line drive circuit 20 according to the operation gestalt of this invention, without changing the liquid crystal display panel section 1, the signal-line drive circuit 20, and the scanning-line drive circuits 11-14 with the former, the motion dotage at the time of animation display can be improved, without causing a cost rise.

[0072]

[Effect of the Invention] As explained above, according to this invention, two or more scanning line and two or more signal lines are arranged in the shape of a grid. It is the drive approach of a liquid crystal display of choosing any one of the scanning line concerned and the signal lines at a stretch, changing the condition of liquid crystal, and performing image display according to image data. Set up the 1st scan period and the 2nd scan period which were set up in time amount shorter than time amount required to scan any one of said the scanning lines, and it sets at said 1st scan period. Since the image according to said image data is displayed through said signal line and the monochromatic image was displayed through said signal line in said 2nd scan period, it moves without causing increase of a circuit scale, and decline in a panel numerical aperture, and is effective in not producing dotage.

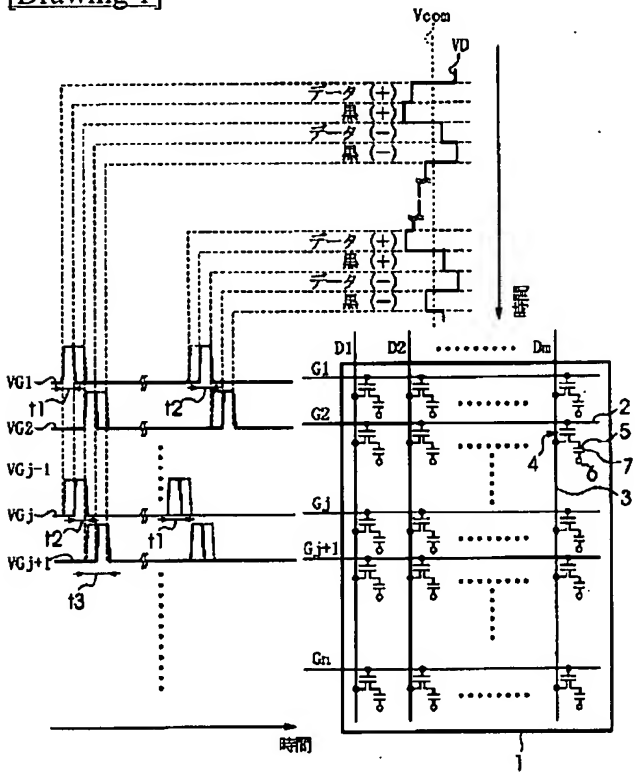
[Translation done.]

* NOTICES *

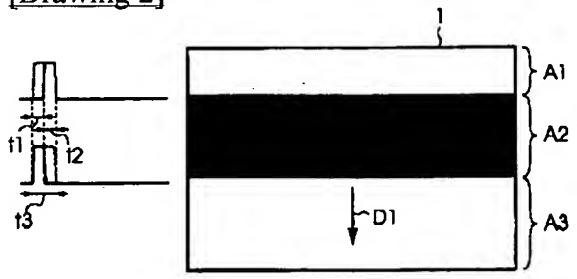
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

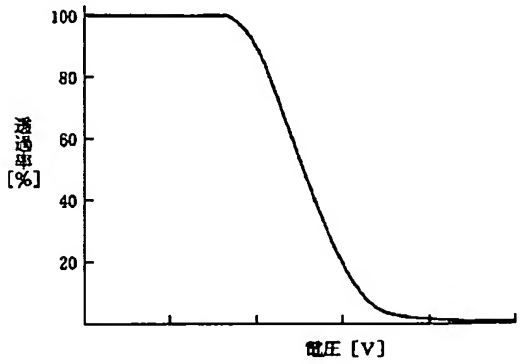
[Drawing 1]



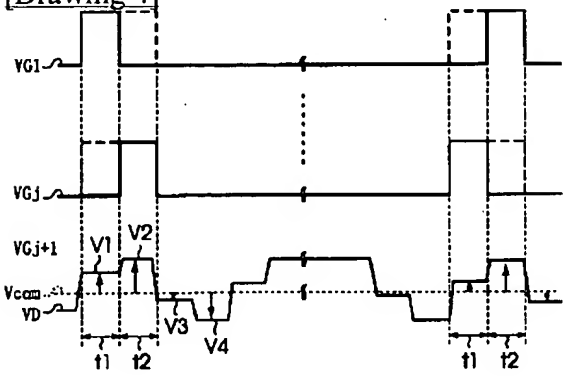
[Drawing 2]



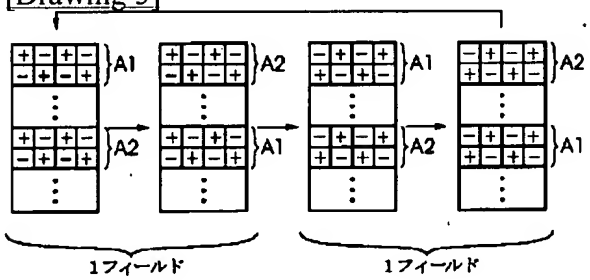
[Drawing 3]



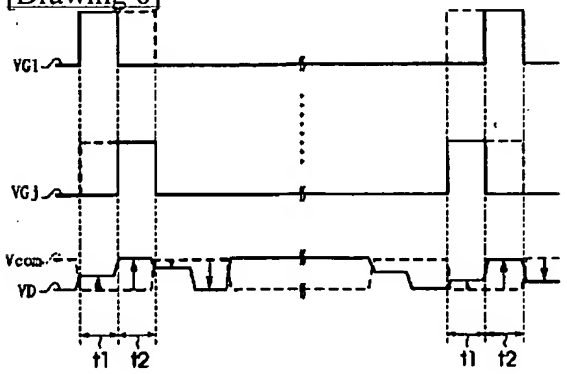
[Drawing 4]



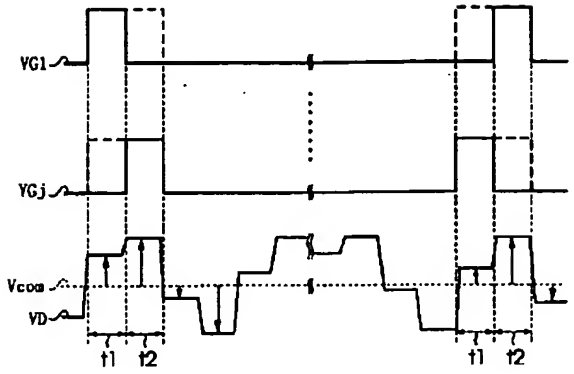
[Drawing 5]



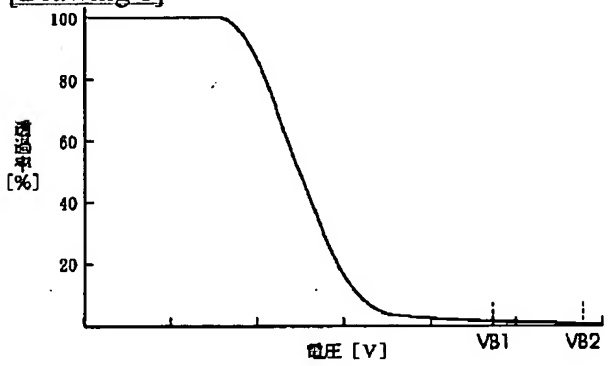
[Drawing 6]



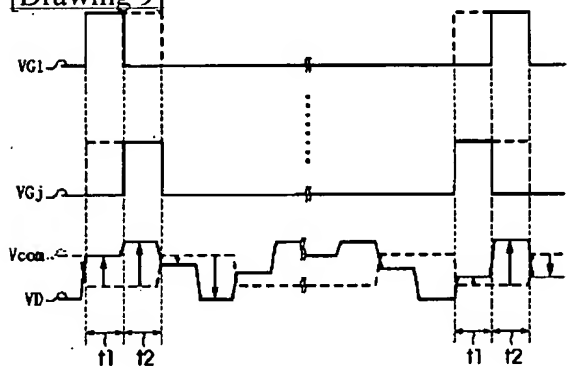
[Drawing 7]



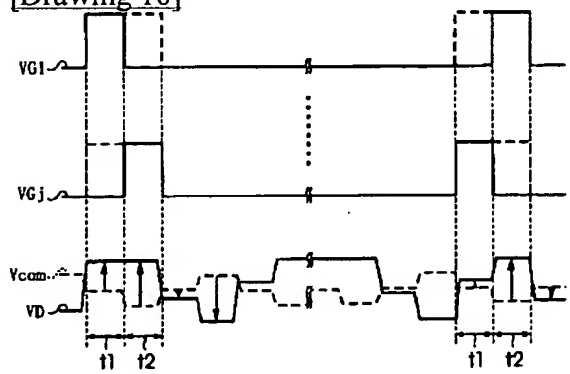
[Drawing 8]



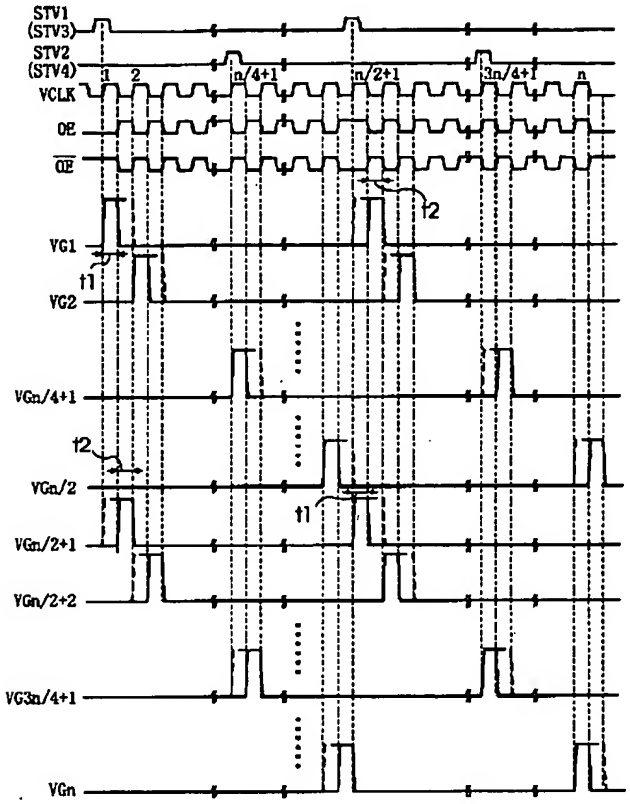
[Drawing 9]



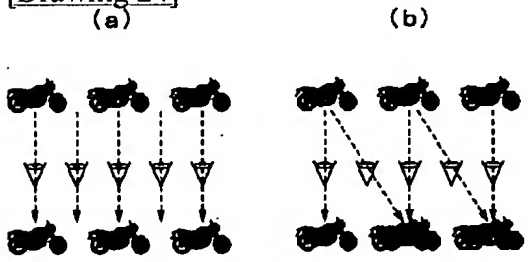
[Drawing 10]



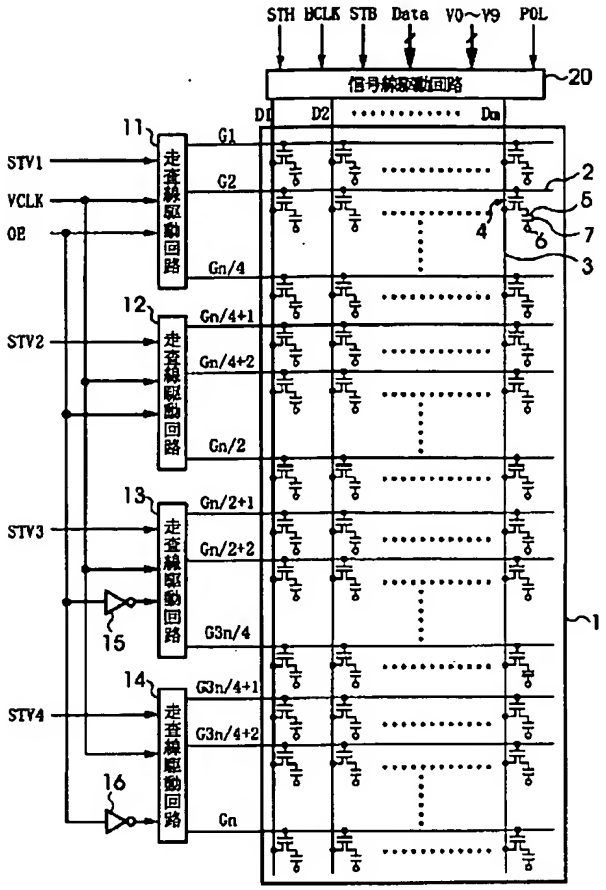
[Drawing 12]



[Drawing 24]



[Drawing 11]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STB
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V0～V9
POL
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D1
D2
Dm
11
12
13
14
15
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STV1
STV2
STV3
STV4
VCLK
OE
G1
G2
Gn/4
Gn/4+1
Gn/4+2
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Gn/2+1
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6
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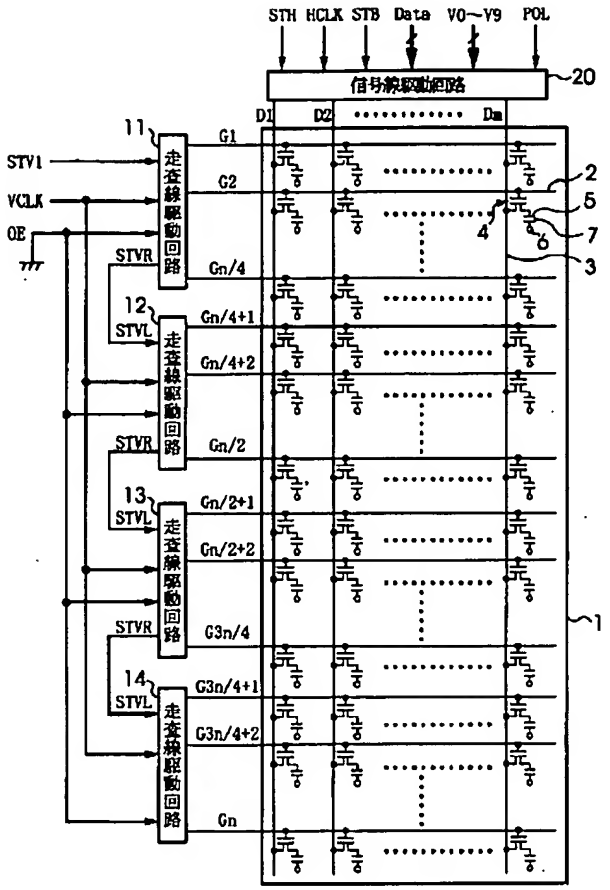
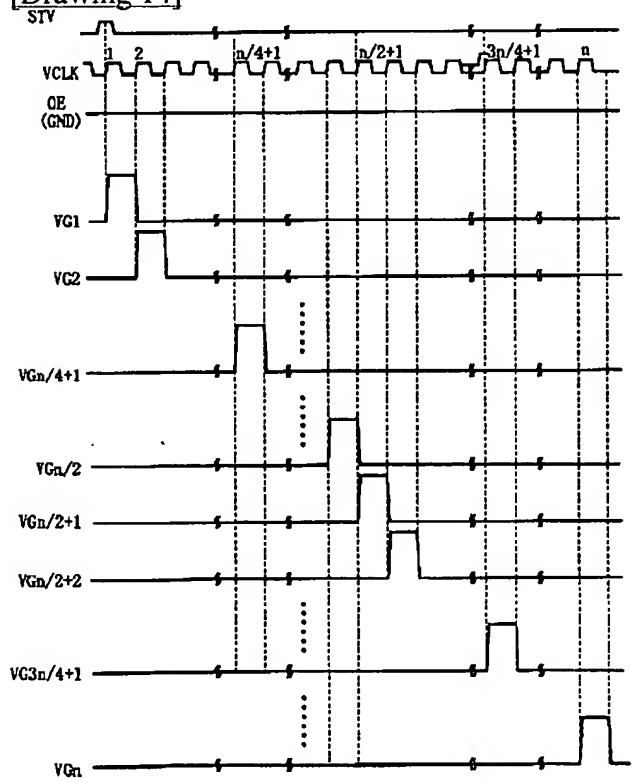
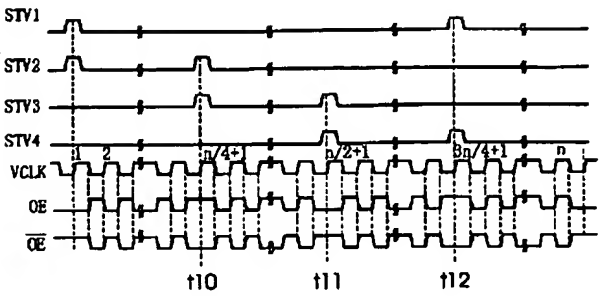
[Drawing 13]



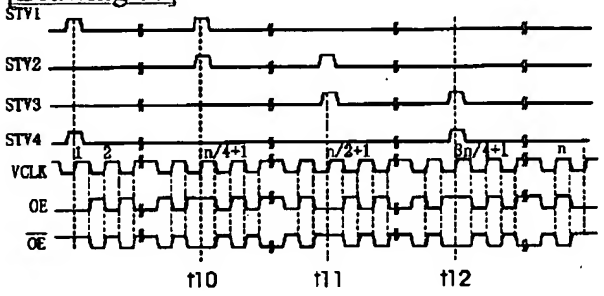
[Drawing 14]



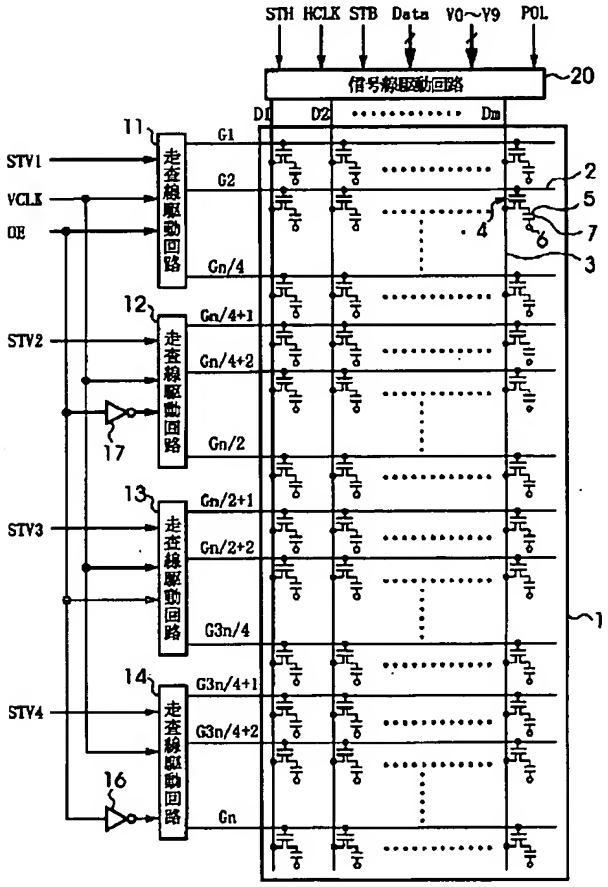
[Drawing 16]



[Drawing 17]



[Drawing 15]



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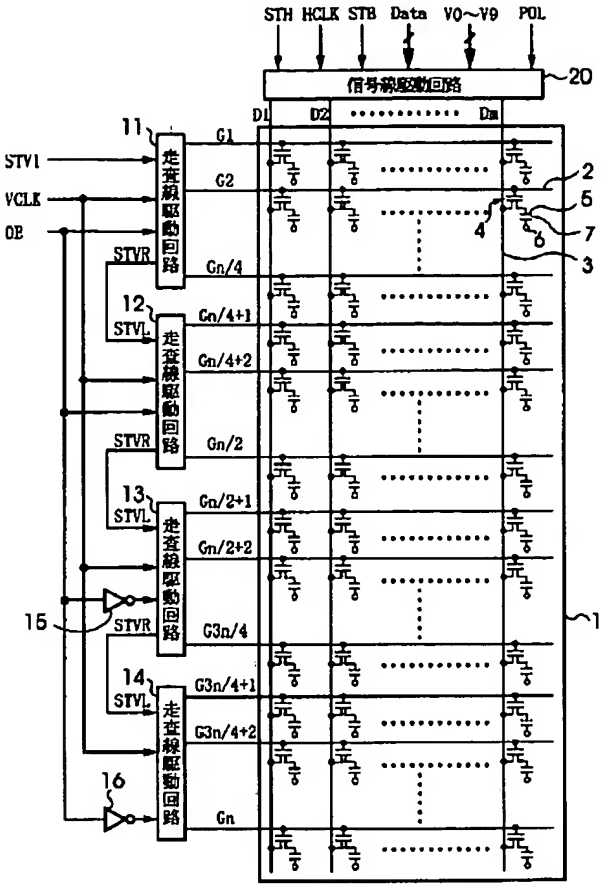
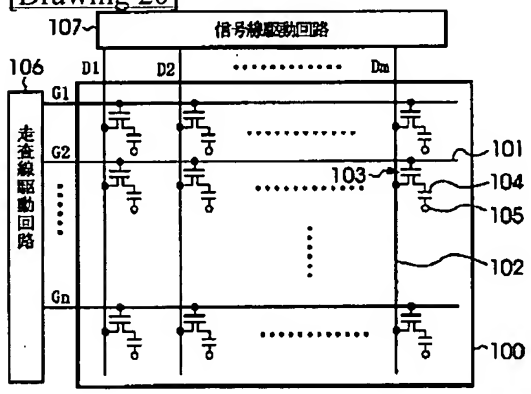


[Drawing 20]



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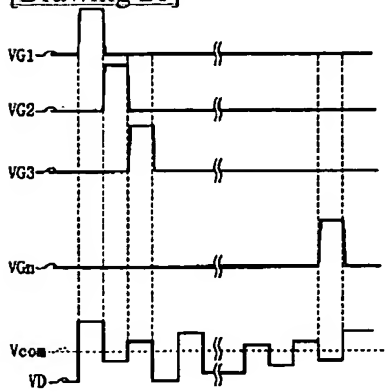
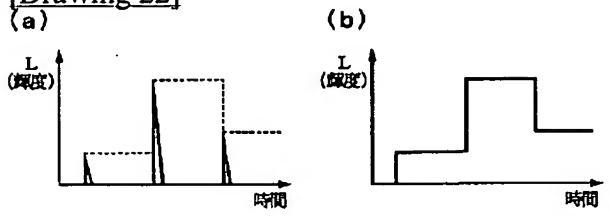


[Drawing 22]



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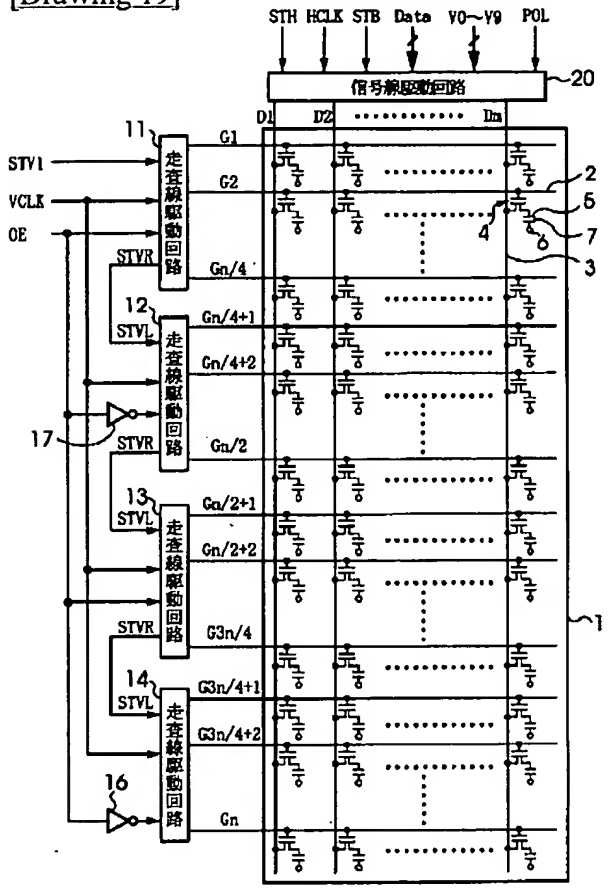
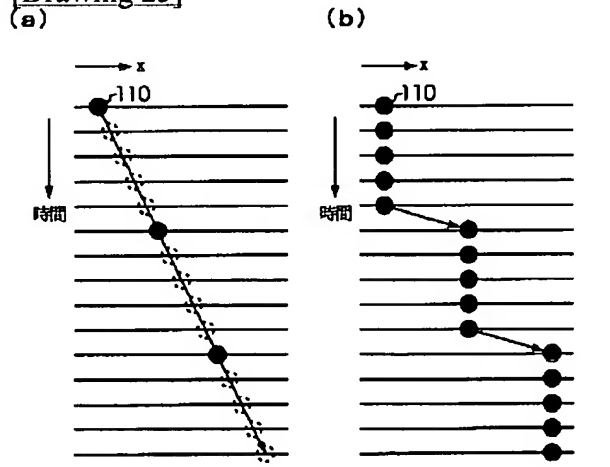


[Drawing 23]



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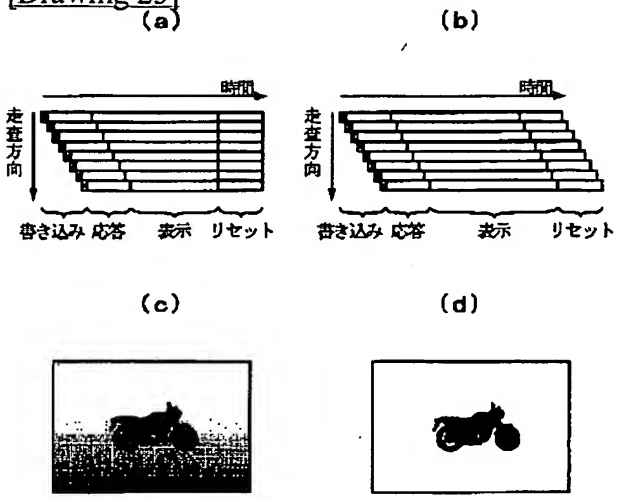
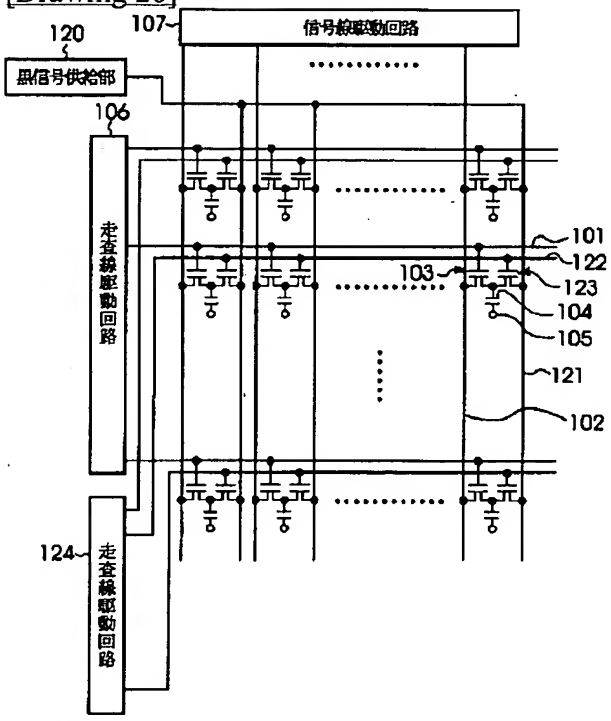


[Drawing 26]



[Translation done.]